Water Planning Information Exchange (Water PIE)

Solution Requirements Document (SRD)

Department of Water Resources
Sacramento, CA

Draft Version 1.1

8/27/13

Water Planning Information Exchange

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SRD Sign Off			
Role	**Name**	**Signature**	**Date**
Subject Matter Experts	Greg Smith		
DTS Technical Team	Danny Luong		
	Brian Niski		
	Jian Song		
	Clyde Blaisdell		
DWR DTS Project Manager	Diane Huey		
DWR or Contractor Business Analyst	Carrie Czajkowski		
Water PIE Program Manager	Greg Smith		

SRD Approval			
Role	**Name**	**Signature**	**Date**
Water PIE Steering Committee	Kamyar Guivetchi		
	Dean Messer		
	Nancy Miller		

Preface:	The Solution Requirements Document (SRD) contains all functional and non-functional requirements of the system (e.g. User Interface, Business Continuity, projected usage, security, training requirements, etc.). It includes a requirements traceability matrix, and Proof of Concept (if needed). It includes the data dictionary and logical data model. It includes by way of reference, all solution Use Cases, including business rules, event flow, storyboards, etc. Data Mapping requirements (if needed) are included.
Author:	Carrie Czajkowski, M Corp
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Document History		
Date	**Version**	**Update Log**
6/10/13	0.01	Draft version of the SRD for informal review by Program Manager and Project Manager
6/19/13	0.02	Draft version of the SRD for Subject Matter Expert Information and DTS Technical review, which includes revised architectural approach from DTS.
8/25/13	1.0	Final SRD for review
8/27/13	1.1	Modifications from DTS on Cost and Stages

PART 1: PURPOSE

The solution requirements specifications are a major deliverable representing the achievement of the solution requirements analysis milestone in a typical systems development life cycle methodology.

Different Types of Requirements

Functional requirements can only be derived following elicitation and documentation of business and user requirements. The distinctions between these different requirements levels are important and are noted below, with the scope of this document covering requirement Type 4 – Functional and Type 5 – Non-Functional:

1. Regulatory Requirements-encompass all the restrictions, licenses, and laws applicable to a product or business. They may be internal (driven by the company itself) or external (driven by a government or other regulatory body), and are usually nonnegotiable. (BRD)

2. Business Requirements-place the business at the center of focus and tie the project to documented strategic, tactical, and operational goals. If developing products or services as part of the overall direction of the company, product or service features need to be covered at a high level in this section, then in detail under User Requirements. (BRD)

3. User Requirements-place the user at the center of focus and describe-with flowcharts, use case diagrams, use case scenarios, and other process models-the TO-BE user experience with the new system. In some cases, especially where business processes are being modified, it may also be necessary to document the AS-IS state of user experience with the current system. (BRD)

4. Functional Requirements-place the proposed system at the center of focus and provide a prioritized list of capabilities the system must demonstrate in order to satisfy business and user requirements.

5. Nonfunctional Requirements-refer to system characteristics that must be fulfilled related to things like the user interface, access security, availability, robustness, system failure, integration, migration, and documentation. As such, they do not deal with the actual functionality of the system, but nevertheless represent key project success factors.

PART 2: FUNCTIONAL REQUIREMENTS

This section prioritizes the requirements.

2.2 Requirements that Determine Project Success

These requirements are identified as the Must Have requirements in the Water PIE Regulatory Business User and Functional Requirements matrix.

2.3 Requirements that Add Value

These requirements are identified as the Desirable requirements in the Water PIE Regulatory Business User and Functional Requirements matrix.

2.4 Requirements that Add Convenience

These requirements are identified as the Nice to Have requirements in the Water PIE Regulatory Business User and Functional Requirements matrix.

2.5 Functional Requirements (Use Cases)

See the Water PIE Use Case.doc for the use cases.

Part 3: Non-Functional Requirements

This part will detail non-functional requirements related to Water PIE. These requirements address system properties and technological specifications for Water PIE.

Section 3.1: Operational Environment

Unique ID	Requirement	Comments
NF.01	The system must use ESRI ArcMap 10.1/10.2 on DWR infrastructure housed at the DWR data center.	*This requirement will be updated to include the current version of the software and one version back.*
NF.02	The hub component of the system must be designed, tiered, housed, and developed on DWR servers.	
NF.03	The system must use a VMware virtual server.	
NF.04	The system must use SQL Server/Oracle database.	
NF.05	The vender must follow DWR Enterprise GIS standards with API.	*Include any applicable standards in the project library.*
NF.06	The system must use ESRI API.	
NF.07	The system may use Bing maps or ESRI ArcGIS for imagery. ESRI ArcGIS online services is recommended.	
NF.08	The vendor must use DWR software configuration and deployment standards, see project library for standards.	*Include DotNet Development standards document in project library.*
NF.09	The system must follow Enterprise GIS web-standards.	
NF.10	The vendor must follow DWR's configuration management policies, see project library for policies.	*Include DotNet Development standards document in project library.*

Section 3.2: User Interface Requirements

Unique ID	Requirement	Comments
NF.11	The user interface must use DWR & State interface standards and Federal 508 Standards.	

Section 3.3: User Access/Security Requirements

Unique ID	Requirement	Comments
NF.13	The system must follow ESRI security standards. For External users consuming the Enterprise web services, they will have to go through the F5 reverse proxy server. For Users accessing and editing the Oracle database, the authentication is through AD.	
NF.14	The system must follow Web Services Security standards as defined by DWR.	
NF.15	The system must be IAAA compliant (Identity, Authorization, Accessibility, Accountability).	
NF.16	The system's access to functionality must be restricted with role-based security policy based on the DWR Authentication and Authorization Protocol.	
NF.17	The system must display all passwords as masked.	
NF.18	The system must be accessible from both the Internet and from within the DWR network.	
NF.19	The system must accommodate 25 concurrent users during peak business times.	

Section 3.4: Service Level /Performance/Capacity Requirements

Unique ID	Requirement	Comments
NF.20	The system must be operation 24 hours a day and 7 days a week.	
NF.21	A message must be displayed on the application launch page if there is an outage or maintenance required.	
NF.22	The vendor must be provide an automated solution if synchronization is required.	
NF.23	The system must send notification to spokes if the hub system is to be brought down.	

Unique ID	Requirement	Comments
NF.24	The system must be able to open and display all forms to the user within 3 seconds over a 100 Mbps network connection.	
NF.25	The system must be able to display summary data requests results within 3 seconds over a 100 Mbps network connection.	
NF.26	The system must display HUB generated artifacts within 3 seconds over a100 Mbps network connection (i.e. documents and or shapefiles).	
NF.27	The system must batch queries that exceed (X) amount of time to complete. The 'X' must be determined during performance testing with DWR.	
NF.28	The system must accommodate at least 15 new spokes per year.	
NF.29	The vendor must follow DWR Data Modeling Standards; see project library for DWR standards.	*Include DotNet Development standards document in project library.*
NF.30	The common language must be scalable to 3 times greater over the first 5 years, starting with 10,000 terms.	
NF.30	The system must be N Tiered.	
NF.31	The vendor must specify a Geodatabase for the web application that: a) Supports all features of the user interface. b) Support the overall solution, including the data model, roles, authentication and authorization, and reporting. c) Work with ESRI ArcGIS.	
NF.32	The system must use ESRI SDO geometry (Oracle Spatial) for storing and querying geospatial data within the ESRI Geodatabase.	

Unique ID	Requirement	Comments
NF.33	The system must run on Microsoft Internet Information Server 6.0 web server or later.	*This requirement will be updated to include the current version of the software and one version back.*
NF.34	The system must support web browsers IE8 or higher; Firefox 2 or later, Safari, and Google Chrome.	*This requirement will be updated to include the current version of the software and one version back.*
NF.35	The system must not implement business logic in the database.	
NF.36	All business logic routines must be placed in business layer components.	
NF.37	All data logic must be encapsulated in a Data Access Object layer.	
NF.38	The system should use ADO.NET Entity Framework.	Please confirm this requirement.
NF.39	The system must follow Service Oriented Architecture.	
NF.40	The system must run on Windows Service 64bit and must have most current Service Pack.	*This requirement will be updated to include the current version of the software and one version back.*
NF.41	The system must support ASP.Net framework for web-based forms technology of Version 4.0 or higher.	*This requirement will be updated to include the current version of the software and one version back.*
NF.42	The system must be cross compatible to SQL Server and Oracle.	
NF.43	The system must support Enterprise Service Bus (ESB) Architecture.	

Unique ID	Requirement	Comments
NF.44	The system must support the upload and storage of the following file types: Word Excel, PDF, and XML with a maximum file size of 50 megabytes.	
NF.45	The vendor must provide a three-month postproduction support and transition to operations and maintenance.	
NF.46	The vendor must provide technical and knowledge transfer to DTS IT staff on a weekly basis via recorded WebEx.	
NF.47	The vendor must design and develop the connection mechanism for each phase II spoke.	
NF.48	The vendor must work with each phase II spoke to develop and implement the connection to Water PIE.	
NF.49	The system must log and send “meaningful” notifications for the following: · application errors · infrastructure errors · connection errors	
NF.50	The system must log and notify DWR Water PIE Administrators of system errors.	
NF.51	The system must notify the DWR Water PIE Administrator when spoke system or web services are down.	
NF.52	The system must support error messaging on the status of a spoke or any connection issues.	

Section 3.5: Administrative/Backup/Archive Requirements

Unique ID	Requirement	Comments
NF.53	The system must support daily backups.	

Section 3.6: Documentation Requirements

Unique ID	Requirement	Comments
NF.54	The vendor must produce deliverables defined in the Systems Development Life Cycle and Project Management Principles. The DWR Project Management methodology is consistent with the California Technology Agency Project Management Framework. See the project library for the SDLC process to be followed.	*Include the SDLC process document and SCM-Process-By-Technology document in project library.*
NF.55	The vendor must produce end-user user guide for the different roles.	
NF.56	The vendor must produce end-user guide for the general public to use Water PIE.	
NF.57	The vendor must produce a workflow process for users to participate and share information in Water PIE.	
NF.58	The vendor must check in source code in daily.	
NF.59	The vendor must produce Requirement Traceability Matrix that shows how requirements are traced from inception through testing.	
NF.60	The vendor must start the operations manual at project inception and update monthly thereafter.	

Section 3.7: Training & Testing Requirements

Unique ID	Requirement	Comments
NF.61	The vendor must provide the following artifacts: a. Training Plan b. Technical Reference Materials c. Process Instruction Materials d. Technical Instruction Materials i) Application Developer User Guide ii) Admin User Guide - GIS and Hub iii) Operation Manual - GIS and Hub	
NF.62	The vendor must develop online user guides and a help section within the system (solution) to support users of the system to include the following: 1. Conduct one train-the-trainer sessions for DWR Water PIE Administration 2. Provide one training session for spoke stewards that include spoke stewards from future spokes. 3. Create one presentation for the California Water Plan Steering and Advisory Committees	
NF.63	The vendor must plan, prepare materials and execute the following: · System Testing · Unit Testing · Integration Testing · Regression Testing (As Necessary)	
NF.64	The vendor must support code review by DWR or its representative.	
NF.65	The vendor must support User Acceptance testing.	

Part 4: Traceability Matrix

Functional Requirement Reference Number	User	Business	Regulatory
UM.02		UM.01	
UM.04	UM.03		
UM.05	UM.03		
UM.06	UM.03		
UM.07	UM.03		
UM.09		UM.08	
UM.10		UM.08	
MS.02		MS.01	
MS.03		MS.01	
MS.04		MS.01	
MS.05		MS.01	
MS.07		MS.06	
MS.08		MS.06	
MS.10.01	MS.09		
MS.10.02	MS.09		
MS.10.03	MS.09		
MS.10.04	MS.09		
MS.10.05	MS.09		
MS.10.06	MS.09		
MS.10.07	MS.09		
MS.10.08	MS.09		
MS.10.09	MS.09		
MS.10.10	MS.09		
MS.10.11	MS.09		
MS.10.12	MS.09		
MS.10.13	MS.09		
MS.12.01	MS.11		
MS.12.02	MS.11		
MS.12.03	MS.11		
MS.12.04	MS.11		
MS.12.05	MS.11		
MS.12.06	MS.11		
MS.12.07	MS.11		
MS.12.08	MS.11		
MS.12.09	MS.11		
MS.12.10	MS.11		
MS.13	MS.11		
MS.14		UM.08	
MS.15		UM.08	
MS.16		UM.08	
MS.17		UM.08	

Functional Requirement Reference Number	User	Business	Regulatory
MS.20		UM.08	
PS.06	PS.05		
PS.07	PS.05		
PS.08	PS.05		
PS.09	PS.05		
PS.10.01	PS.10		
PS.10.02	PS.10		
PS.10.03	PS.10		
PS.10.04	PS.10		
PS.12	PS.04		
PS.13	PS.04		
PS.18	PS.05		
PS.19	PS.05		
PS.20	PS.05		
PS.21	PS.05		
PS.22	PS.04		
PS.23	PS.05		
PS.24	PS.02		
PS.25	PS.02		
PS.27.01	PS.01		
PS.27.02	PS.01		
PS.27.03	PS.01		
PS.27.04	PS.01		
PS.27.05	PS.01		
PS.27.06	PS.01		
PS.27.07	PS.01		
PS.33	PS.31		
PS.34	PS.29		
PS.35	PS.29		
PS.36	PS.17		
PS.37	PS.17		
PS.38	PS.02		
PS.39	PS.02		
PS.40	PS.02		
PS.44	MS.12.03		
PS.50	PS.27.05		
PS.52	PS.50		
PS.53	PS.50		
PS.54	PS.50		
PS.55	PS.50		
PS.56	PS.50		
PS.57	PS.50		
PS.58	PS.51		

Functional Requirement Reference Number	User	Business	Regulatory
PS.59	PS.51		
PS.60	PS.51		
PS.61	PS.51		
PS.62	PS.51		
WPA.01	PS.14		
WPA.02	PS.11		
WPA.03	PS.11		
WPA.04	PS.12		
WPA.05	PS.27		
WPA.06	PS.27		
WPA.07	MS.06		
WPA.08	MS.06		
WPA.09	MS.06		
WPA.11	WPA.10		
MWP.02	MWP.01		
MWP.03	MWP.01		
MWP.04	MWP.01		
MWP.05	MWP.01		
MWP.06	MWP.01		

PART 5: SOLUTION OPTIONS

DWR is looking for a creative solution to meet the business and user needs of its staff and stakeholders. In considering the appropriate solution, DWR considered several options:

1) Pure web services approach, minimal storage of water-related data
2) Storing a copy of each spoke application at DTS, but allow the spoke to manage the copy
3) Hybrid of the first two approaches allowing organizations to choose to store their data at DTS or connect through an at rest method

DWR worked with DTS to determine the best approach. The team determined the hybrid solution best supports the short-term and long-term business needs of the Department and its stakeholders. This solution supports small organizations with limited technical staff by providing space at DTS in which they can manage a copy of their data. This limits impact to cost to the spoke, spoke production performance, and Water PIE performance. This solution also supports organizations that may not be willing or able to provide DTS with a copy of their data. For example, some potential Federal sources make data available to multiple organizations through existing web services. Tapping into the existing services will minimize cost to the spoke and allow connection to vital data.

Water PIE will employ DWR General Data Platform (DWR-GDP) architecture. The objective of the DWR-GDP is to provide a platform that can be configured to handle many different types of data input, data processing, and data output, all contained within a highly scalable environment.

At the highest level of the architecture, the GDP is divided into four domains:

1) Access
2) Processing
3) Storage, and
4) Reporting

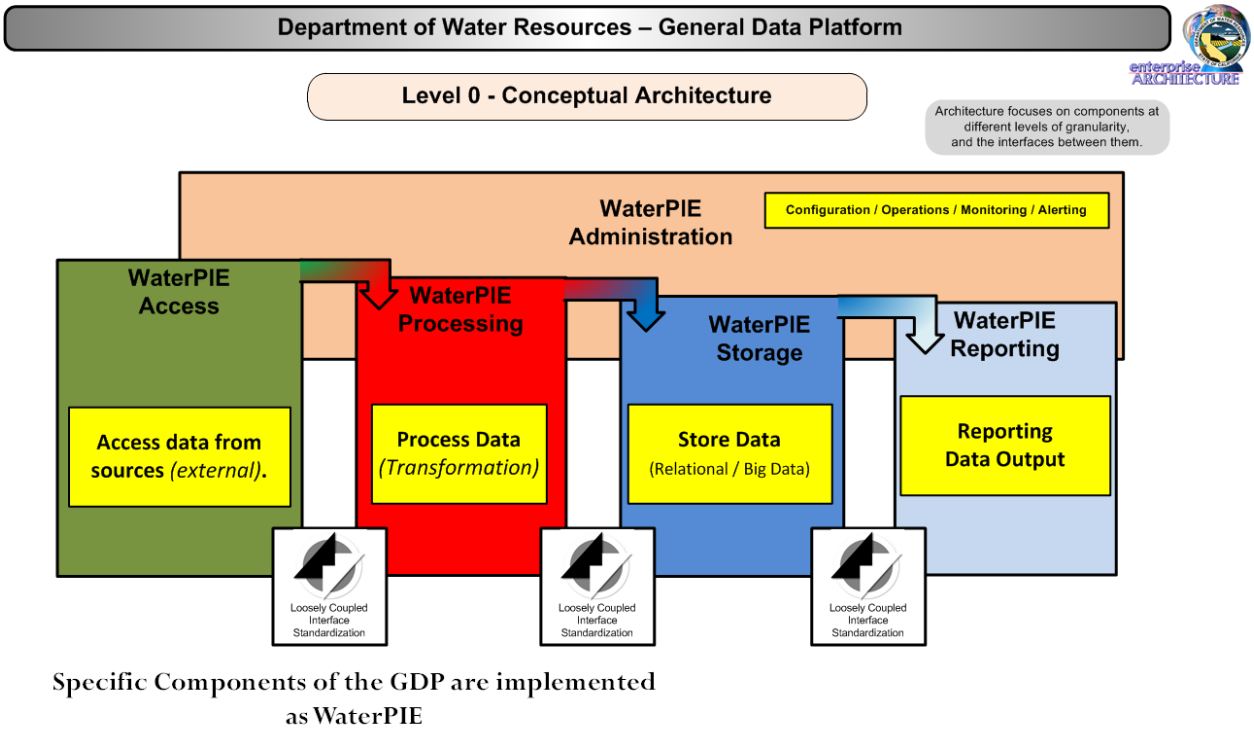

Figure 1. DWR-GDP Conceptual Architecture

Section 5.1: Access

The Access domain supports accessing data from the data source. Data access will be initiated from either side (e.g. data source or Water PIE server) in a push, pull, push/pull, or accessed at rest. This method will support dynamic and scheduled pulls of data.

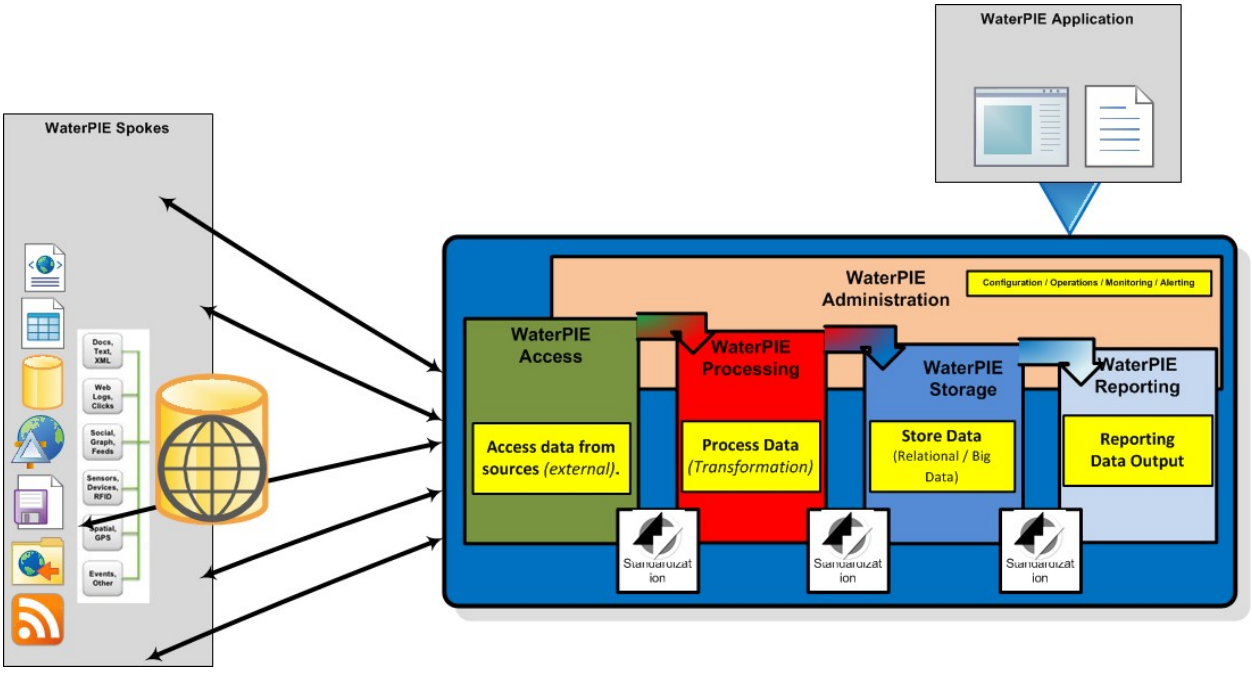

Figure 2. DWR-GDP Collection

The DWR-GDP does not define or dictate specific file types and/or interfaces for data access. Instead, the architecture supports standard Extract, Transform, and Load (ETL) functionality.

Section 5.2: Processing

The processing domain supports processing the retrieved data for storage. In Water PIE, this may include the update of statistical information, summary and aggregate information, as well as transformation and data cleansing. Transformation refers to mapping the retrieved data to Water PIE's common language.

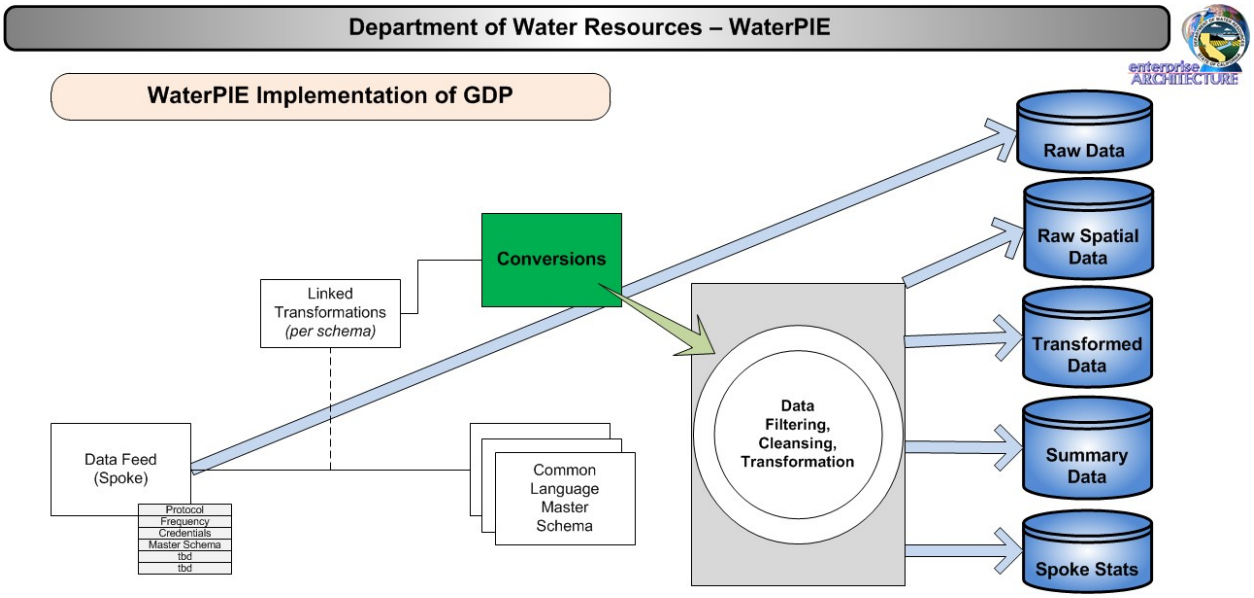

Figure 3. DWR-GDP Processing

Section 5.3: Storage

The Storage domain supports storage of the data. Storage can be persisted or temporary depending on the data source and does not restrict the number of data stores, types of data, or storage mechanisms. Data stores can be both relational and non-relational data. The storage of data will improve search performance and support future analytic needs.

Section 5.4: Reporting

The Reporting domain supports reporting of the data. The architecture supports:

1) HTML
2) File
3) SOAP Service
4) REST Service

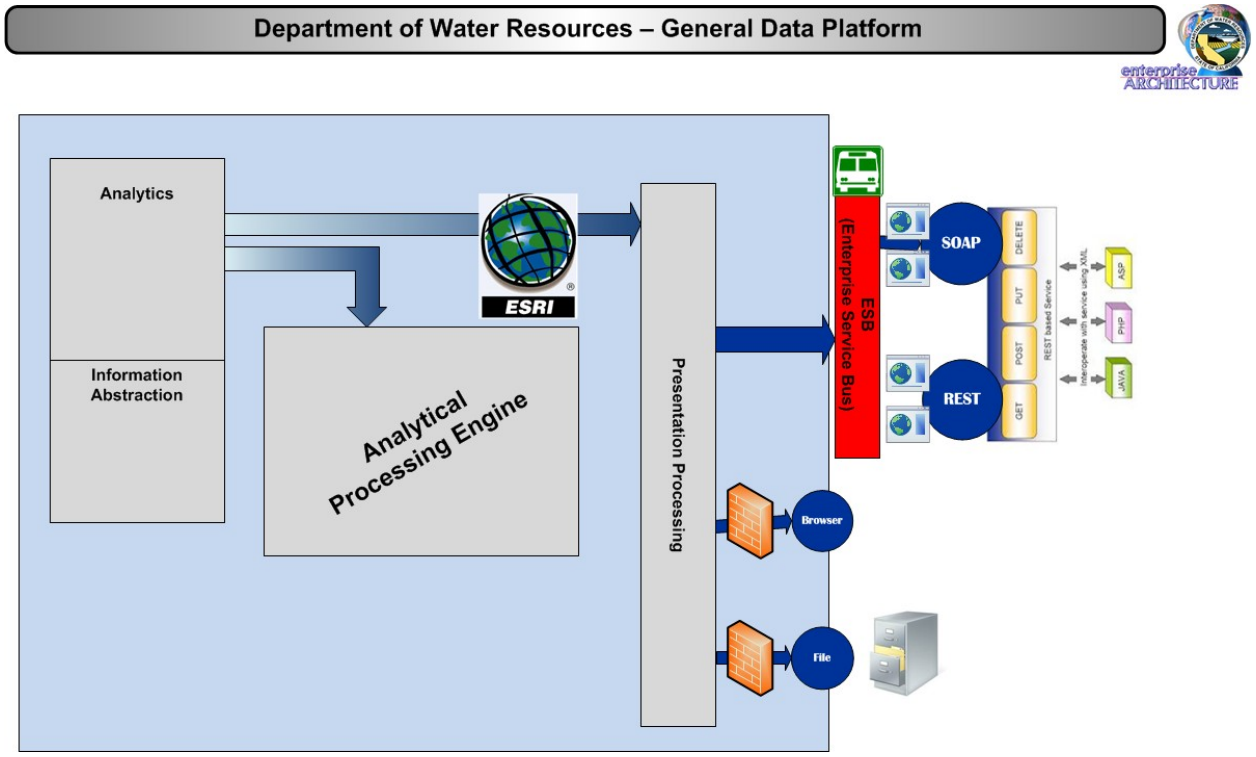

Figure 4. DWR-GDP Reporting

Part 6: Projected Usage Statistics

Section 6.1 Number of Users

The following table includes the anticipated users for Water PIE Phase II:

Total	Performing Writes
2	DWR Water PIE Administrators
6	Spoke Stewards
2,000 to 7,500 per spoke	Registered Users

DWR anticipates the addition of up to 15 spokes per year with an average of 2 to 3 Spoke Administrators per spoke. DWR anticipates the number of registered users will increase exponentially based on the number of spokes and general awareness of the Water PIE grows. DWR has experienced a growth in usage of other GIS water-related systems.

Section 6.2 Average Transaction Volume / Month

The following is a summary of transaction volumes for WDL Groundwater and Water Quality. The transaction data provides a picture of potential average usage per spoke.

The following is a count of the number of accesses for Groundwater and Water Quality each month for a 12-month period.

Month	Groundwater	Water Quality
1	59,060	7,115
2	137,423	8,267
3	202,235	8,823
4	202,505	7,466
5	95,439	5,757
6	219,531	7,936
7	218,265	7,736
8	254,076	5,564
9	303,042	9,659
10	464,058	12,331
11	344,099	10,575
12	362,882	9,405

The following table provides a count of the average Annual Number of Visitors to WDL:

Year	Groundwater	Water Quality
2009	10,068	2,726
2010	22,043	6,880
2011	Not included due to incomplete totals	
2012	13,899	3,687

Part 7: Proof of Concept

Section 7.1: Purpose for the proof of concept

In an effort to prioritize the development and implementation effort, DWR determined the need to phase the development effort into stages. The project team worked with DTS to identify the following potential stages of development for Water PIE:

Stage 1 Build Foundation and Water PIE Framework	**Stage 2 Define Water PIE Attributes and Data**	**Stage 3 Internal Pilot and Refinement**	**Stage 4 Define Additional Users**	**Stage 5 Open to the Public**
Hardware and Software Platform Environments (3) • Development • Test • Staging	Use Staging Environment	Implement and Use Production Environment	• Identify no more than 5 additional data sources (combined internal/external) • Identify External Pilot User group • Expand Internal DWR use	Water PIE is operational and new data sources can be added.
Development and documentation of Detailed System Requirements for Foundation and Water PIE Services	Validation and update of system requirements	Provide User System Improvement Feedback Method	Document new data sources requirements	
Communication Layer to include: • FTP • SOAP • REST • HTTPS • Enterprise Service Bus Integration	Incorporation of Define Data Sources (5) : • CASGEM • Suisun Marsh • WDL – Water Quality USGS • EPA	Internal Pilot Group Use System in Production manner and identify system areas that need improved and/or refined	• Incorporate additional defined data sources to the Water PIE framework • Perform External Pilot User Group Training/Education Sessions and give system access	
Water PIE Defined Services includes: • Functional Components	Refinement of : • Communication Layer protocol	Refinement of : • Water PIE Services and User Interfaces	Refinement of : • Communication Layer protocol services	

Stage 1 Build Foundation and Water PIE Framework	Stage 2 Define Water PIE Attributes and Data	Stage 3 Internal Pilot and Refinement	Stage 4 Define Additional Users	Stage 5 Open to the Public
• API • Defined Web-Services • Defined Base Maps • Administrative Interfaces • System Presentation Interface	services • Water PIE Services and User Interfaces		• Water PIE Services and User Interfaces	
• End-to-End Unit and System component and services testing	• Control-Group Testing • Performance Testing	• Pilot Users Testing • Continued System and Performance Testing	• External and Internal Pilot Testing • Continue System and Performance monitoring and tuning	

Note: the project team discussed adding two additional Data Sources USGS and EPA.

Section 7.2: Resources, Cost, and Duration for the development of Water PIE

The following provides a rough order of magnitude cost assessment for development of Phase II of Water PIE. The project team worked with DTS to develop the resource requirements and cost based on the development of the potential solution architecture described in Part 5.

Water PIE Estimated Project Cost based on Approach: $1,303,180. Note: this project cost does not include internal DWR staff labor cost or annual operational cost.

Stage 1 Build Foundation and Water PIE Framework	Stage 2 Define Water PIE Attributes and Data	Stage 3 Internal Pilot and Refinement	Stage 4 Define Additional Users	Stage 5 Open to the Public
Project Resources: • Project Manager • Solution Architect • Technical Lead • Developers • GIS Expert • System Analyst	Project Resources: • Project Manager • Solution Architect • Technical Lead • Developers • GIS Expert • System Analyst	Project Resources: • Project Manager • Solution Architect • Technical Lead • Developers • GIS Expert • System Analyst	Project Resources: • Project Manager • Solution Architect • Technical Lead • Developers • GIS Expert • System Analyst	Project Resources: • None –System Operational
BA Subject Matter Experts: • DSIWM	BA Subject Matter Experts: • DSIWM • DES	BA Subject Matter Experts: • DSIWM • DES • TBD	BA Subject Matter Experts: • DSIWM • DES • TBD	
Operational Resources: • DTS Infrastructure	Operational Resources: • DTS Infrastructure	Operational Resources: • DTS Infrastructure	Operational Resources: • DTS Infrastructure • DSIWM	Operational Resources: • DTS Infrastructure • DTS Applications • DSIWM
Duration				
6 months	3 months	2 months	3 months	End
Costs				

Stage 1 Build Foundation and Water PIE Framework	Stage 2 Define Water PIE Attributes and Data	Stage 3 Internal Pilot and Refinement	Stage 4 Define Additional Users	Stage 5 Open to the Public
Resource Costs:				
$637,000	$264,000	$134,000	$191,000	$0
IT Infrastructure (servers, data storage, etc.)	$50,000			
Software	$25,000			
Total Estimated Project Cost	**$131,000**			

Assumptions: The project team estimated durations and costs based on the assumption that required resources will be provided as identified.

Annual operational costs are estimated to be $34,000.

Appendix A: Technical Subject Matter Experts

The following table lists the technical subject matter experts who participated in the development of the functional requirements.

Division of Technology Services
Danny Luong, DWR GIS Lead
Brian Niski, Enterprise Architecture
Jian Song, IT Architecture
Clyde Blaisdell, Enterprise Architect